WHAT IS CLAIMED IS

1. A distributed Bragg reflector, comprising:

a first semiconductor layer having a first, larger refractive index;

a second semiconductor layer having a second refractive index, said first refractive index larger than said second refractive index, said first and second semiconductor layers being stacked alternately, and

a material layer having a refractive index intermediate between said first and second refractive indices, having a thickness equal to or larger than 5 nm but equal to or smaller than 50 nm, and having a third refractive index intermediate between said first and second refractive indices,

wherein said distributed Bragg reflector is tuned to a wavelength of 1.1 μm or longer.

2. A distributed Bragg reflector as claimed in claim 1, wherein said material layer has a thickness equal to or larger than 20 nm.

3. A distributed Bragg reflector as claimed in claim 1, wherein said material layer has a thickness equal to or larger than 30 nm.

4. A distributed Bragg reflector as claimed in claim 2, wherein said first and second semiconductor layers are formed of any of AlAs, GaAs and AlGaAs, and wherein there is a difference of Al content of less than 80% between said first semiconductor layer and said second semiconductor layer.

5. A distributed Bragg reflector as claimed in claim 3, wherein said first semiconductor layer and said second semiconductor layer are formed of any of AlAs, GaAs and AlGaAs, and wherein there is a difference of Al content of 80% or more between said first semiconductor layer and said second semiconductor layer.

6. A distributed Bragg reflector, comprising:

a first semiconductor layer having a first refractive index;

a second semiconductor layer having a second refractive index, said first refractive index larger than said second refractive index, said first and second semiconductor layers being stacked alternately; and

a material layer having a third refractive index intermediate between said first and second refractive indices, said distributed Bragg reflector being tuned to a wavelength of 1.1 μm or longer,

said material layer having a thickness

smaller than $(50\lambda-15)$ (nm) where λ is a tuned wavelength of the distributed Bragg reflector.

7. A distributed Bragg reflector as claimed in claim 6, wherein said material layer has a thickness of 20 nm or more.

8. A distributed Bragg reflector as claimed in claim 6, wherein said material layer has a thickness of 30 nm or more.

9. A distributed Bragg reflector, comprising:

a first semiconductor layer having a first bandgap;

a second semiconductor layer having a

second bandgap, said first bandgap smaller than said second bandgap, said first and second semiconductor layers being stacked alternately; and

a material layer having a third bandgap intermediate between said first and second bandgaps, provided between said first and second semiconductor layer,

said material layer changing a valence band energy thereof in a thickness direction from said first semiconductor layer to said second semiconductor layer,

said material layer comprising a first layer adjacent to said first semiconductor layer and a second layer adjacent to said second semiconductor layer, and

said first layer and second layer having first and second rates of compositional change such that said first rate being larger than said second rate.

10. A distributed Bragg reflector as claimed in claim 9, wherein said intermediate layer

changes said valence band energy continuously and gradually from said first semiconductor layer to said second semiconductor layer.

11. A distributed Bragg reflector as claimed in claim 9, wherein said intermediate layer changes said valence band energy stepwise from said first semiconductor layer to said second semiconductor layer.

12. A distributed Bragg reflector as claimed in claim 9, wherein said intermediate layer comprises a layer in which said valence band energy changes continuously and a layer in which said valence band energy changes stepwise.

13. A distributed Bragg reflector as claimed in claim 9, wherein said first and second layers have respective first and second thicknesses, such that said first thickness is smaller than said second thickness.

14. A distributed Bragg reflector as claimed in claim 9, wherein there is a stepped change of valence band energy at an interface between said first semiconductor layer and said material layer.

15. A distributed Bragg reflector as claimed in claim 9, wherein said first and second semiconductor layers comprise a material of AlGaAs system.

16. A distributed Bragg reflector as claimed in claim 9, wherein said first and second semiconductor layers comprise a material of AlGaInP system.

17. A distributed Bragg reflector as claimed in claim 9, wherein said first and second semiconductor layers and said intermediate layer have a carrier density of 5 x $10^{17}cm^{-3}$ - 2 x $10^{18}cm^{-3}$,

said intermediate layer has a thickness in the rage of 5 - 40 nm, and said intermediate layer is characterized by an average change rate of Al content in the range of 0.02 - 0.15 nm^{-1}.

18. A surface-emission laser diode, comprising:

an active layer; and

a resonator cooperating with said active layer, said active layer comprising upper and lower

reflectors disposed above and below said active layer, at least one of said upper and lower reflectors comprising a distributed Bragg reflector, comprising:

a first semiconductor layer having a first refractive index;

a second semiconductor layer having a second refractive index, said first refractive index larger than said second refractive index, said first and second semiconductor layers being stacked alternately; and

a material layer having a third refractive index intermediate between said first and second refractive indices, said distributed Bragg reflector being tuned to a wavelength of 1.1 μm or longer,

said material layer having a thickness equal to or larger than 5 nm but equal to or smaller than 50 nm.

19. A surface-emission laser diode as claimed in claim 18, wherein said material layer has a thickness equal to or larger than 20 nm.

20. A surface-emission laser diode as claimed in claim 18, wherein said material layer has a thickness equal to or larger than 30 nm.

21. A surface-emission laser diode as claimed in claim 19, wherein said first and second semiconductor layers are formed of any of AlAs, GaAs and AlGaAs, and wherein there is a difference of Al content of less than 80% between said first semiconductor layer and said second semiconductor layer.

22. A surface-emission laser diode as claimed in claim 20, wherein said first semiconductor layer and said second semiconductor layer are formed of any of AlAs, GaAs and AlGaAs, and wherein there is a difference of Al content of 80% or more between said first semiconductor layer and said second semiconductor layer.

23. A surface-emission laser diode as claimed in claim 18, wherein said active layer is formed of any of a GaNAs layer, a GaInAs layer, a GaInNAs layer, a GaAsSb layer, a GaInAsSb layer, and a GaInNAsSb layer.

24. A surface-emission laser diode, comprising:

an active layer; and

a resonator cooperating with said active layer, said active layer comprising upper and lower reflectors disposed above and below said active layer,

at least one of said upper and lower reflectors comprising a distributed Bragg reflector, comprising:

a first semiconductor layer having a first refractive index;

a second semiconductor layer having a second refractive index, said first refractive index larger than said second refractive index, said first and second semiconductor layers being stacked alternately;

a material layer having a third refractive index intermediate between said first and second refractive indices, said distributed Bragg reflector being tuned to a wavelength of 1.1 μm or longer,

said material layer having a thickness smaller than $(50\lambda - 15)$ (nm) where λ is a tuned wavelength of the distributed Bragg reflector.

25. A surface-emission laser diode as claimed in claim 24, wherein said material layer has a thickness of 20 nm or more.

26. A surface-emission laser diode as claimed in claim 24, wherein said material layer has a thickness of 30 nm or more.

27. A surface-emission laser diode as claimed in claim 24, wherein said active layer is formed of any of a GaNAs layer, a GaInAs layer, a GaInNAs layer, a GaAsSb layer, a GaInAsSb layer, and a GaInNAsSb layer.

28. A surface-emission laser diode, comprising:

an active layer; and

a resonator cooperating with said active layer, said active layer comprising upper and lower reflectors disposed above and below said active layer,

at least one of said upper and lower reflectors comprising a distributed Bragg reflector, comprising:

a first semiconductor layer having a first bandgap;

a second semiconductor layer having a second bandgap, said first bandgap smaller than said second bandgap, said first and second semiconductor layers being stacked alternately; and

a material layer having a third bandgap

intermediate between said first and second bandgaps, provided between said first and second semiconductor layer,

said material layer changing a valence band energy thereof in a thickness direction from said first semiconductor layer to said second semiconductor layer,

said material layer comprising a first layer adjacent to said first semiconductor layer and a second layer adjacent to said second semiconductor layer, and

said first layer and second layer having first and second rates of compositional change such that said first rate being larger than said second rate.

29. A surface-emission laser diode as claimed in claim 28, wherein said intermediate layer changes said valence band energy continuously and gradually from said first semiconductor layer to said second semiconductor layer.

30. A surface-emission laser diode as claimed in claim 28, wherein said intermediate layer changes said valence band energy stepwise from said first semiconductor layer to said second semiconductor layer.

31. A surface-emission laser diode as claimed in claim 28, wherein said intermediate layer comprises a layer in which said valence band energy changes continuously and a layer in which said valence band energy changes stepwise.

32. A surface-emission laser diode as claimed in claim 28, wherein said first and second layers have respective first and second thicknesses, such that said first thickness is smaller than said second thickness.

33. A surface-emission laser diode as claimed in claim 28, wherein there is a stepped change of valence band energy at an interface between said first semiconductor layer and said material layer.

34. A surface-emission laser diode as claimed in claim 28, wherein said first and second semiconductor layers comprise a material of AlGaAs system.

35. A surface-emission laser diode as claimed in claim 28, wherein said first and second semiconductor layers comprise a material of AlGaInP system.

36. A surface-emission laser diode as claimed in claim 28, wherein said first and second semiconductor layers and said intermediate layer have a carrier density of $5 \times 10^{17}cm^{-3} - 2 \times 10^{18}cm^{-3}$, and wherein said intermediate layer has a thickness in the rage of 5 - 40 nm, and wherein said intermediate layer is characterized by an average change rate of Al content in the range of $0.02 - 0.15\ nm^{-1}$.

37. A laser diode array, comprising:

a substrate; and

a plurality of surface-emission laser diodes formed commonly on said substrate, each of said plurality of surface-emission laser diodes comprising:

an active layer; and

a resonator cooperating with said active layer, said active layer comprising upper and lower reflectors disposed above and below said active layer,

at least one of said upper and lower reflectors comprising a distributed Bragg reflector, comprising:

a first semiconductor layer having a first refractive index;

a second semiconductor layer having a second refractive index, said first refractive index larger than said second refractive index, said first and second semiconductor layers being stacked alternately; and

a material layer having a third refractive index intermediate between said first and second refractive indices, said distributed Bragg reflector being tuned to a wavelength of 1.1 μm or longer,

said material layer having a thickness equal to or larger than 5 nm but equal to or smaller than 50 nm.

38. A laser diode array, comprising:

a substrate; and

a plurality of surface-emission laser diodes formed commonly on said substrate, each of said surface emission laser diodes comprising:

an active layer; and

a resonator cooperating with said active

layer, said active layer comprising upper and lower reflectors disposed above and below said active layer,

at least one of said upper and lower reflectors comprising a distributed Bragg reflector, comprising:

a first semiconductor layer having a first refractive index;

a second semiconductor layer having a second refractive index, said first refractive index larger than said second refractive index, said first and second semiconductor layers being stacked alternately; and

a material layer having a third refractive index intermediate between said first and second refractive indices, said distributed Bragg reflector being tuned to a wavelength of 1.1 μm or longer,

said material layer having a thickness smaller than $(50\lambda-15)$ (nm) where λ is a tuned wavelength of the distributed Bragg reflector.

39. A surface-emission laser diode array, comprising:

a substrate; and

a plurality of laser diodes, each of said surface-emission laser diodes, comprising:

an active layer; and

a resonator cooperating with said active layer, said active layer comprising upper and lower reflectors disposed above and below said active layer,

at least one of said upper and lower reflectors comprising a distributed Bragg reflector, comprising:

a first semiconductor layer having a first bandgap;

a second semiconductor layer having a second bandgap, said first bandgap smaller than said second bandgap, said first and second semiconductor layers being stacked alternately; and

a material layer having a third bandgap intermediate between said first and second bandgaps, provided between said first and second semiconductor layer,

said material layer changing a valence band energy thereof in a thickness direction from said first semiconductor layer to said second semiconductor layer,

said material layer comprising a first

layer adjacent to said first semiconductor layer and a second layer adjacent to said second semiconductor layer, and

said first layer and second layer having first and second rates of compositional change such that said first rate being larger than said second rate.

40. An optical interconnection system, comprising:

a surface-emission laser diode; and

an optical transmission path coupled optically to said surface-emission laser diode,

said surface-emission laser diode comprising:

an active layer; and

a resonator cooperating with said active layer, said active layer comprising upper and lower reflectors disposed above and below said active layer,

at least one of said upper and lower reflectors comprising a distributed Bragg reflector, comprising:

a first semiconductor layer having a first refractive index;

a second semiconductor layer having a second refractive index, said first refractive index larger than said second refractive index, said first and second semiconductor layers being stacked alternately; and

a material layer having a third refractive index intermediate between said first and second refractive indices,

said distributed Bragg reflector being tuned to a wavelength of 1.1 μm or longer, and

said material layer having a thickness equal to or larger than 5 nm but equal to or smaller than 50 nm.

41. An optical interconnection system, comprising:

a surface-emission laser diode; and

an optical transmission path coupled optically to said surface-emission laser diode,

said surface-emission laser diode

comprising:

an active layer; and

a resonator cooperating with said active layer, said active layer comprising upper and lower reflectors disposed above and below said active layer,

at least one of said upper and lower reflectors comprising a distributed Bragg reflector, comprising:

a first semiconductor layer having a first refractive index;

a second semiconductor layer having a second refractive index, said first refractive index larger than said second refractive index, said first and second semiconductor layers being stacked alternately; and

a material layer having a third refractive index intermediate between said first and second refractive indices, and

wherein there is provided a material layer having a refractive index intermediate between said first refractive index and said second refractive index,

said material layer having a thickness smaller than $(50\lambda-15)$ (nm) where λ is a tuned wavelength of the distributed Bragg reflector.

42. An optical interconnection system, comprising:

a surface-emission laser diode; and

an optical transmission path coupled optically to said surface-emission laser diode,

said surface-emission laser diode comprising:

an active layer; and

a resonator cooperating with said active layer, said active layer comprising upper and lower reflectors disposed above and below said active layer,

at least one of said upper and lower reflectors comprising a distributed Bragg reflector, comprising:

a first semiconductor layer having a first bandgap;

a second semiconductor layer having a second bandgap, said first bandgap smaller than said second bandgap, said first and second semiconductor layers being stacked alternately; and

a material layer having a third bandgap intermediate between said first and second bandgaps, provided between said first and second semiconductor layer,

said material layer changing a valence band

energy thereof in a thickness direction from said first semiconductor layer to said second semiconductor layer, and

said material layer comprising a first layer adjacent to said first semiconductor layer and a second layer adjacent to said second semiconductor layer,

said first layer and second layer having first and second rates of compositional change such that said first rate being larger than said second rate.

43. An optical interconnection system, comprising:

a surface-emission laser diode array comprising a substrate and a plurality of surface-emission laser diodes provided commonly on said substrate; and

an optical transmission path coupled optically to each of said plurality of surface-emission laser diodes,

each of said plurality of surface-emission

laser diodes comprising:

an active layer; and

a resonator cooperating with said active layer, said active layer comprising upper and lower reflectors disposed above and below said active layer,

at least one of said upper and lower reflectors comprising a distributed Bragg reflector, comprising:

a first semiconductor layer having a first refractive index;

a second semiconductor layer having a second refractive index, said first refractive index larger than said second refractive index, said first and second semiconductor layers being stacked alternately; and

a material layer having a third refractive index intermediate between said first and second refractive indices,

said distributed Bragg reflector being tuned to a wavelength of 1.1 μm or longer, and

said material layer having a thickness equal to or larger than 5 nm but equal to or smaller than 50 nm.

44. An optical interconnection system, comprising:

a surface-emission laser diode array comprising a substrate and a plurality of surface-emission laser diodes formed commonly on said substrate; and

an optical transmission path coupled optically to each of said plurality of surface-emission laser diodes,

each of said surface-emission laser diodes comprising:

an active layer; and

a resonator cooperating with said active layer, said active layer comprising upper and lower reflectors disposed above and below said active layer,

at least one of said upper and lower reflectors comprising a distributed Bragg reflector, comprising:

a first semiconductor layer having a first refractive index;

a second semiconductor layer having a second refractive index, said first refractive index larger than said second refractive index, said first and second semiconductor layers being stacked alternately; and

a material layer having a third refractive index intermediate between said first and second refractive indices,

said distributed Bragg reflector being tuned to a wavelength of 1.1 μm or longer,

said material layer having a thickness smaller than $(50\lambda-15)$ [nm] where λ is a tuned wavelength of the distributed Bragg reflector.

45. An optical interconnection system, comprising:

a surface-emission laser diode array comprising a plurality of surface-emission laser diodes; and

an optical transmission path coupled optically to each of said plurality of surface-emission laser diodes,

each of said surface-emission laser diodes comprising:

an active layer; and

a resonator cooperating with said active layer, said active layer comprising upper and lower

reflectors disposed above and below said active layer,

at least one of said upper and lower reflectors comprising a distributed Bragg reflector, comprising:

a first semiconductor layer having a first bandgap;

a second semiconductor layer having a second bandgap, said first bandgap smaller than said second bandgap, said first and second semiconductor layers being stacked alternately; and

a material layer having a third bandgap intermediate between said first and second bandgaps, provided between said first and second semiconductor layer,

said material layer changing a valence band energy thereof in a thickness direction from said first semiconductor layer to said second semiconductor layer,

said material layer comprising a first layer adjacent to said first semiconductor layer and a second layer adjacent to said second semiconductor layer, and

said first layer and second layer having first and second rates of compositional change such that said first rate being larger than said second

rate.

46. An optical telecommunication system, comprising:

a surface-emission laser diode; and

an optical transmission path coupled optically to said surface-emission laser diode,

said surface-emission laser diode comprising:

an active layer; and

a resonator cooperating with said active layer, said active layer comprising upper and lower reflectors disposed above and below said active layer,

at least one of said upper and lower reflectors comprising a distributed Bragg reflector, comprising:

a first semiconductor layer having a first refractive index;

a second semiconductor layer having a second refractive index, said first refractive index larger than said second refractive index, said first and second semiconductor layers being stacked

alternately; and

a material layer having a third refractive index intermediate between said first and second refractive indices,

said distributed Bragg reflector being tuned to a wavelength of 1.1 μm or longer, and

said material layer having a thickness equal to or larger than 5 nm but equal to or smaller than 50 nm.

47. An optical telecommunication system, comprising:

a surface-emission laser diode; and

an optical transmission path coupled optically to said surface-emission laser diode,

said surface-emission laser diode comprising:

an active layer; and

a resonator cooperating with said active layer, said active layer comprising upper and lower reflectors disposed above and below said active layer,

at least one of said upper and lower

reflectors comprising a distributed Bragg reflector, comprising:

a first semiconductor layer having a first refractive index;

a second semiconductor layer having a second refractive index, said first refractive index larger than said second refractive index, said first and second semiconductor layers being stacked alternately; and

a material layer having a third refractive index intermediate between said first and second refractive indices,

said distributed Bragg reflector being tuned to a wavelength of 1.1 μm or longer, and

said material layer having a thickness smaller than $(50\lambda-15)$ [nm] where λ is a tuned wavelength of the distributed Bragg reflector.

48. An optical telecommunication system, comprising:

a surface-emission laser diode; and

an optical transmission path coupled

optically to said surface-emission laser diode,

said surface-emission laser diode comprising:

an active layer; and

a resonator cooperating with said active layer, said active layer comprising upper and lower reflectors disposed above and below said active layer,

at least one of said upper and lower reflectors comprising a distributed Bragg reflector, comprising:

a first semiconductor layer having a first bandgap;

a second semiconductor layer having a second bandgap, said first bandgap smaller than said second bandgap, said first and second semiconductor layers being stacked alternately; and

a material layer having a third bandgap intermediate between said first and second bandgaps, provided between said first and second semiconductor layer,

said material layer changing a valence band energy thereof in a thickness direction from said first semiconductor layer to said second semiconductor layer,

said material layer comprising a first

layer adjacent to said first semiconductor layer and a second layer adjacent to said second semiconductor layer, and

said first layer and second layer having first and second rates of compositional change such that said first rate being larger than said second rate.

49. An optical telecommunication system, comprising:

a surface-emission laser diode array comprising a substrate and a plurality of surface-emission laser diodes provided commonly on said substrate; and

an optical transmission path coupled optically to each of said plurality of surface-emission laser diodes,

each of said plurality of surface-emission laser diodes comprising:

an active layer; and

a resonator cooperating with said active layer, said active layer comprising upper and lower

reflectors disposed above and below said active layer,

at least one of said upper and lower reflectors comprising a distributed Bragg reflector, comprising:

a first semiconductor layer having a first refractive index;

a second semiconductor layer having a second refractive index, said first refractive index larger than said second refractive index, said first and second semiconductor layers being stacked alternately; and

a material layer having a third refractive index intermediate between said first and second refractive indices,

said distributed Bragg reflector being tuned to a wavelength of 1.1 μm or longer, and

said material layer having a thickness equal to or larger than 5 nm but equal to or smaller than 50 nm.

50. An optical telecommunication system, comprising:

a surface-emission laser diode array comprising a substrate and a plurality of surface-emission laser diodes formed commonly on said substrate; and

an optical transmission path coupled optically to each of said plurality of surface-emission laser diodes,

each of said surface-emission laser diodes comprising:

an active layer; and

a resonator cooperating with said active layer, said active layer comprising upper and lower reflectors disposed above and below said active layer,

at least one of said upper and lower reflectors comprising a distributed Bragg reflector, comprising:

a first semiconductor layer having a first refractive index;

a second semiconductor layer having a second refractive index, said first refractive index larger than said second refractive index, said first and second semiconductor layers being stacked alternately; and

a material layer having a third refractive index intermediate between said first and second

refractive indices,

said distributed Bragg reflector being tuned to a wavelength of 1.1 μm or longer, and

said material layer having a thickness smaller than $(50\lambda-15)$ (nm) where λ is a tuned wavelength of the distributed Bragg reflector.

51. An optical telecommunication system, comprising:

a surface-emission laser diode array comprising a plurality of surface-emission laser diodes; and

an optical transmission path coupled optically to each of said plurality of surface-emission laser diodes,

each of said surface-emission laser diodes comprising:

an active layer; and

a resonator cooperating with said active layer, said active layer comprising upper and lower reflectors disposed above and below said active layer,

at least one of said upper and lower

reflectors comprising a distributed Bragg reflector, comprising:

a first semiconductor layer having a first bandgap;

a second semiconductor layer having a second bandgap, said first bandgap smaller than said second bandgap, said first and second semiconductor layers being stacked alternately; and

a material layer having a third bandgap intermediate between said first and second bandgaps, provided between said first and second semiconductor layer,

said material layer changing a valence band energy thereof in a thickness direction from said first semiconductor layer to said second semiconductor layer,

said material layer comprising a first layer adjacent to said first semiconductor layer and a second layer adjacent to said second semiconductor layer,

said first layer and second layer having first and second rates of compositional change such that said first rate being larger than said second rate.

52. An optical transmission/reception system, comprising:

an optical source formed of a surface-emission laser diode device, said surface-emission laser diode comprising: an active layer of any of a layer containing Ga, In, N and As as major constituent elements thereof and a layer containing Ga, In and As as major constituent elements thereof, said active layer producing optical radiation with a laser oscillation wavelength of 1.1 - 1.7 μm; and a cavity structure comprising a pair of reflectors provided above and below said active layer, each of said reflectors forming a semiconductor distributed Bragg reflector reflecting optical radiation having a wavelength of 1.1μm or more and comprising an alternate and repetitive stacking of a first material layer of $Al_xGa_{1-x}As$ ($0<x\leqq1$) and a second material layer of $Al_yGa_{1-y}As$ ($0\leqq y<x\leqq1$), wherein there is provided a hetero spike buffer layer between said first material layer and said second material layer, said hetero spike buffer layer having a refractive index intermediate between a refractive index of said first material layer and a refractive index of said second material layer, said hetero spike buffer layer having a composition represented as AlzGa1-zAs ($0\leqq$

$y<z<x\leqq 1$) and a thickness of 20 - 50 nm;

an optical fiber transmission path having an end coupled optically to said optical source; and

a photodetection unit coupled to the other end of said optical fiber transmission path,

said optical fiber transmission path being bent between a point A, in which said optical source is provided, and a point B, in which said photodetection unit is provided, such that there is no localized angle formed in said optical fiber transmission path.

53. An optical transmission/reception system, comprising:

an optical source formed of a surface-emission laser diode device, said surface-emission laser diode comprising: an active layer of any of a layer containing Ga, In, N and As as major constituent elements thereof and a layer containing Ga, In and As as major constituent elements thereof, said active layer producing optical radiation with a laser oscillation wavelength of 1.1 - 1.7 μm; and a

cavity structure comprising a pair of reflectors provided above and below said active layer, each of said reflectors forming a semiconductor distributed Bragg reflector reflecting optical radiation having a wavelength of 1.1μm or more and comprising an alternate and repetitive stacking of a first material layer of $Al_xGa_{1-x}As$ ($0<x\leqq1$) and a second material layer of $Al_yGa_{1-y}As$ ($0\leqq y<x\leqq1$), wherein there is provided a hetero spike buffer layer between said first material layer and said second material layer, said hetero spike buffer layer having a refractive index intermediate between a refractive index of said first material layer and a refractive index of said second material layer, said hetero spike buffer layer having a composition represented as AlzGa1-zAs ($0\leqq y<z<x\leqq1$) and a thickness of 20 - 50 nm;

an optical fiber transmission path having an end coupled to said optical source;

a photodetection unit coupled to another end of said optical fiber transmission path; and

a mirror provided between a point A, in which said optical source is provided, and a point B, in which said photodetection unit is provided, said mirror changing a direction of propagation of an optical signal transmitted through said optical fiber

transmission path.

54. An optical transmission/reception system for use in an apparatus, comprising:

an apparatus body;

a surface-emission laser diode device provided in said apparatus body as a laser optical source, said laser optical source producing an optical signal;

a photodetection unit provided in said apparatus body, said photodetection unit receiving said optical signal;

a cover member covering a light emitting part of said laser optical source; and

another cover member covering a photodetection part of said photodetection unit,

said surface-emission laser diode comprising: an active layer of any of a layer containing Ga, In, N and As as major constituent elements thereof and a layer containing Ga, In and As as major constituent elements thereof, said active layer producing optical radiation with a laser

oscillation wavelength of 1.1 - 1.7 μm; and a cavity structure comprising a pair of reflectors provided above and below said active layer, each of said reflectors forming a semiconductor distributed Bragg reflector reflecting optical radiation having a wavelength of 1.1μm or more and comprising an alternate and repetitive stacking of a first material layer of $Al_xGa_{1-x}As$ ($0<x\leqq1$) and a second material layer of $Al_yGa_{1-y}As$ ($0\leqq y<x\leqq1$), wherein there is provided a hetero spike buffer layer between said first material layer and said second material layer, said hetero spike buffer layer having a refractive index intermediate between a refractive index of said first material layer and a refractive index of said second material layer, said hetero spike buffer layer having a composition represented as AlzGal-zAs ($0\leqq y<z<x\leqq1$) and a thickness of 20 - 50 nm.

55. An optical telecommunication system, comprising:

a laser diode;

a first optical fiber coupled optically to

said laser diode, said first optical fiber being injected with a laser beam produced by said laser diode;

a second optical fiber coupled optically to said first optical fiber, said second optical fiber being injected with an optical signal transmitted through said first optical fiber;

a third optical fiber coupled optically to said second optical fiber, said third optical fiber being injected with an optical signal transmitted through said second optical fiber; and

a photodetector coupled optically to said third optical fiber, said photodetector detecting an optical signal transmitted through said third optical fiber,

said laser diode comprising a surface-emission laser diode chip and comprising: an active layer of any of a layer containing Ga, In, N and As as major constituent elements thereof and a layer containing Ga, In and As as major constituent elements thereof, said active layer producing optical radiation with a laser oscillation wavelength of 1.1 - 1.7 μm; and a cavity structure comprising a pair of reflectors provided above and below said active layer, each of said reflectors forming a

semiconductor distributed Bragg reflector reflecting optical radiation having a wavelength of 1.1μm or more and comprising an alternate and repetitive stacking of a first material layer of $Al_xGa_{1-x}As$ ($0<x \leqq 1$) and a second material layer of $Al_yGa_{1-y}As$ ($0 \leqq y<x \leqq 1$), wherein there is provided a hetero spike buffer layer between said first material layer and said second material layer, said hetero spike buffer layer having a refractive index intermediate between a refractive index of said first material layer and a refractive index of said second material layer, said hetero spike buffer layer having a composition represented as AlzGa1-zAs ($0 \leqq y<z<x \leqq 1$) and a thickness of 20 - 50 nm.

56. An optical telecommunication system, comprising:

a laser diode;

a first optical fiber coupled optically to said laser diode, said first optical fiber being injected with a laser beam produced by said laser diode;

a second optical fiber coupled optically to said first optical fiber, said second optical fiber being injected with an optical signal transmitted through said first optical fiber;

a third optical fiber coupled optically to said second optical fiber, said third optical fiber being injected with an optical signal transmitted through said second optical fiber,

said laser diode comprising a surface-emission laser diode chip and comprising: an active layer of any of a layer containing Ga, In, N and As as major constituent elements thereof and a layer containing Ga, In and As as major constituent elements thereof, said active layer producing optical radiation with a laser oscillation wavelength of 1.1 - 1.7 μm; and a cavity structure comprising a pair of reflectors provided above and below said active layer, each of said reflectors forming a semiconductor distributed Bragg reflector reflecting optical radiation having a wavelength of 1.1μm or more and comprising an alternate and repetitive stacking of a first material layer of $Al_xGa_{1-x}As$ ($0<x\leqq 1$) and a second material layer of $Al_yGa_{1-y}As$ ($0\leqq y<x\leqq 1$), wherein there is provided a hetero spike buffer layer between said first material layer and said

second material layer, said hetero spike buffer layer having a refractive index intermediate between a refractive index of said first material layer and a refractive index of said second material layer, said hetero spike buffer layer having a composition represented as AlzGa1-zAs ($0 \leqq y < z < x \leqq 1$) and a thickness of 20 - 50 nm,

said first optical fiber having a length of 1 mm or more.

57. An optical telecommunication system comprising:

a laser diode; and

an optical transmission path coupled optically to said laser diode,

said laser diode comprising a surface-emission laser diode chip and comprising: an active layer of any of a layer containing Ga, In, N and As as major constituent elements thereof and a layer containing Ga, In and As as major constituent elements thereof, said active layer producing optical radiation with a laser oscillation wavelength of 1.1

- 1.7 μm; and a cavity structure comprising a pair of reflectors provided above and below said active layer, each of said reflectors forming a semiconductor distributed Bragg reflector reflecting optical radiation having a wavelength of 1.1μm or more and comprising an alternate and repetitive stacking of a first material layer of $Al_xGa_{1-x}As$ ($0<x \leqq 1$) and a second material layer of $Al_yGa_{1-y}As$ ($0\leqq y<x \leqq 1$), wherein there is provided a hetero spike buffer layer between said first material layer and said second material layer, said hetero spike buffer layer having a refractive index intermediate between a refractive index of said first material layer and a refractive index of said second material layer, said hetero spike buffer layer having a composition represented as AlzGa1-zAs ($0\leqq y<z<x\leqq 1$) and a thickness of 20 - 50 nm,

said optical transmission path comprising an optical fiber having a length L, said optical fiber including a core having a diameter D and a clad,

wherein there holds a relationship $10^5 \leqq L/D \leqq 10^9$.

58. An optical telecommunication system, comprising:

a laser diode,

a mount substrate on which said laser diode is mounted;

said laser diode comprising a surface-emission laser diode chip and comprising: an active layer of any of a layer containing Ga, In, N and As as major constituent elements thereof and a layer containing Ga, In and As as major constituent elements thereof, said active layer producing optical radiation with a laser oscillation wavelength of 1.1 - 1.7 μm; and a cavity structure comprising a pair of reflectors provided above and below said active layer, each of said reflectors forming a semiconductor distributed Bragg reflector reflecting optical radiation having a wavelength of 1.1μm or more and comprising an alternate and repetitive stacking of a first material layer of $Al_xGa_{1-x}As$ ($0<x \leqq 1$) and a second material layer of $Al_yGa_{1-y}As$ ($0 \leqq y<x \leqq 1$), wherein there is provided a hetero spike buffer layer between said first material layer and said second material layer, said hetero spike buffer layer having a refractive index intermediate between a refractive index of said first material layer and a

refractive index of said second material layer, said hetero spike buffer layer having a composition represented as AlzGa1-zAs ($0 \leqq y<z<x \leqq 1$) and a thickness of 20 - 50 nm,

wherein a difference of linear thermal expansion coefficient between said laser diode and said substrate is within 2 x 10^{-6}/K.

59. An optical telecommunication system, comprising:

a laser diode; and

an optical fiber coupled optically to said laser diode,

said laser diode comprising a surface-emission laser diode chip and comprising: an active layer of any of a layer containing Ga, In, N and As as major constituent elements thereof and a layer containing Ga, In and As as major constituent elements thereof, said active layer producing optical radiation with a laser oscillation wavelength of 1.1 - 1.7 μm; and a cavity structure comprising a pair of reflectors provided above and below said active

layer, each of said reflectors forming a semiconductor distributed Bragg reflector reflecting optical radiation having a wavelength of 1.1μm or more and comprising an alternate and repetitive stacking of a first material layer of $Al_xGa_{1-x}As$ ($0<x\leqq1$) and a second material layer of $Al_yGa_{1-y}As$ ($0\leqq y<x\leqq1$), wherein there is provided a hetero spike buffer layer between said first material layer and said second material layer, said hetero spike buffer layer having a refractive index intermediate between a refractive index of said first material layer and a refractive index of said second material layer, said hetero spike buffer layer having a composition represented as AlzGa1-zAs ($0\leqq y<z<x\leqq1$) and a thickness of 20 - 50 nm,

wherein said optical fiber is mechanically connected to said laser diode in the state that said optical fiber is urged in an axial direction thereof toward a light emitting part of said laser diode.

60. An optical telecommunication system, comprising:

a laser diode; and

one of an optical fiber and an optical waveguide coupled optically to said laser diode,

said laser diode comprising a surface-emission laser diode chip and comprising: an active layer of any of a layer containing Ga, In, N and As as major constituent elements thereof and a layer containing Ga, In and As as major constituent elements thereof, said active layer producing optical radiation with a laser oscillation wavelength of 1.1 - 1.7 μm; and a cavity structure comprising a pair of reflectors provided above and below said active layer, each of said reflectors forming a semiconductor distributed Bragg reflector reflecting optical radiation having a wavelength of 1.1μm or more and comprising an alternate and repetitive stacking of a first material layer of $Al_xGa_{1-x}As$ ($0<x \leqq 1$) and a second material layer of $Al_yGa_{1-y}As$ ($0 \leqq y<x \leqq 1$), wherein there is provided a hetero spike buffer layer between said first material layer and said second material layer, said hetero spike buffer layer having a refractive index intermediate between a refractive index of said first material layer and a refractive index of said second material layer, said hetero spike buffer layer having a composition

represented as $Al_zGa_{1-z}As$ ($0 \leq y<z<x \leq 1$) and a thickness of 20 - 50 nm,

said optical fiber or said optical waveguide having a core with a diameter X, said laser diode having an aperture d and an optical emission angle θ,

wherein there holds a relationship

$d + 2l\tan(\theta/2) \leq X$,

where l represents an optical path length from said laser diode to an edge of said optical fiber or optical waveguide.

61. An optical telecommunication system, comprising:

a laser diode; and

an optical waveguide coupled optically to said laser diode,

said laser diode comprising a surface-emission laser diode chip and comprising: an active layer of any of a layer containing Ga, In, N and As as major constituent elements thereof and a layer containing Ga, In and As as major constituent

elements thereof, said active layer producing optical radiation with a laser oscillation wavelength of 1.1 – 1.7 μm; and a cavity structure comprising a pair of reflectors provided above and below said active layer, each of said reflectors forming a semiconductor distributed Bragg reflector reflecting optical radiation having a wavelength of 1.1μm or more and comprising an alternate and repetitive stacking of a first material layer of $Al_xGa_{1-x}As$ ($0<x \leqq 1$) and a second material layer of $Al_yGa_{1-y}As$ ($0 \leqq y<x \leqq 1$), wherein there is provided a hetero spike buffer layer between said first material layer and said second material layer, said hetero spike buffer layer having a refractive index intermediate between a refractive index of said first material layer and a refractive index of said second material layer, said hetero spike buffer layer having a composition represented as AlzGa1-zAs ($0 \leqq y<z<x \leqq 1$) and a thickness of 20 – 50 nm,

wherein there holds a relationship

$$0.5 \leqq F/d \leqq 2$$

where d represents a diameter of a circle touching internally to an optical emission part of said laser diode and F represents a core diameter of said optical fiber.

62. An optical telecommunication system, comprising:

a laser diode; and

an optical waveguide coupled optically to a laser chip,

said laser diode comprising a surface-emission laser diode chip and comprising: an active layer of any of a layer containing Ga, In, N and As as major constituent elements thereof and a layer containing Ga, In and As as major constituent elements thereof, said active layer producing optical radiation with a laser oscillation wavelength of 1.1 - 1.7 μm; and a cavity structure comprising a pair of reflectors provided above and below said active layer, each of said reflectors forming a semiconductor distributed Bragg reflector reflecting optical radiation having a wavelength of 1.1μm or more and comprising an alternate and repetitive stacking of a first material layer of $Al_xGa_{1-x}As$ ($0<x \leqq 1$) and a second material layer of $Al_yGa_{1-y}As$ ($0 \leqq y<x \leqq 1$), wherein there is provided a hetero spike buffer layer between said first material layer and said second material layer, said hetero spike buffer layer having a refractive index intermediate between a refractive index of said first material layer and a

refractive index of said second material layer, said hetero spike buffer layer having a composition represented as AlzGa1-zAs ($0 \leqq y<z<x \leqq 1$) and a thickness of 20 - 50 nm,

said laser diode including an optical emission part having an area S [mm^2], said laser diode being driven with an operational voltage V [volts],

wherein a parameter V/S falls in a range from 15000 to 30000.

63. A semiconductor distributed Bragg reflector comprising:

an alternate stacking of first and second semiconductor layers having respective, different refractive indices; and

a plurality of intermediate layers each sandwiched between a first semiconductor layer and a second semiconductor layer, said intermediate layer having a refractive index intermediate between said refractive indices of said first and second semiconductor layers,

an intermediate layer provided in a region of said semiconductor distributed Bragg reflector having a thickness different from an intermediate layer provided in a different region of said semiconductor distributed Bragg reflector.

64. The semiconductor distributed Bragg reflector as claimed in claim 63, wherein a difference of bandgap between said first and second semiconductor layers is set smaller in a region of said semiconductor distributed Bragg reflector where said intermediate layer has an increased thickness than in a region of said distributed Bragg reflector where said intermediate layer has a reduced thickness.

65. The semiconductor distributed Bragg reflector as claimed in claim 63, wherein said intermediate layers have different thickness and different doping concentrations within said

semiconductor distributed Bragg reflector, said thickness and doping concentration being changed in correspondence to electric field strength of light within said semiconductor distributed Bragg reflector.

66. The semiconductor distributed Bragg reflector as claimed in claim 65, wherein said intermediate layer has an increased thickness and reduced impurity doping concentration in a region of said semiconductor distributed Bragg reflector where the electric field strength of light is large, and wherein said intermediate layer is formed to have a reduced thickness and increased impurity doping concentration in a region of said semiconductor distributed Bragg reflector where the electric field strength of light is small.

67. The semiconductor distributed Bragg reflector as claimed in claim 63, wherein said

semiconductor distributed Bragg reflector has a design reflection wavelength of 1.1μm or longer.

68. A surface-emission laser diode having a semiconductor distributed Bragg reflector, said semiconductor distributed Bragg reflector comprising:

an alternate stacking of first and second semiconductor layers having respective, different refractive indices; and

a plurality of intermediate layers each sandwiched between a first semiconductor layer and a second semiconductor layer, said intermediate layer having a refractive index intermediate between said refractive indices of said first and second semiconductor layers,

an intermediate layer provided in a region of said semiconductor distributed Bragg reflector having a thickness different from an intermediate layer provided in a different region of said semiconductor distributed Bragg reflector.

69. The surface-emission laser diode as claimed in claim 68, wherein a difference of bandgap between said first and second semiconductor layers is set smaller in a region of said semiconductor distributed Bragg reflector where said intermediate layer has an increased thickness than in a region of said distributed Bragg reflector where said intermediate layer has a reduced thickness.

70. The surface-emission laser diode as claimed in claim 68, wherein said intermediate layers have different thickness and different doping concentrations within said semiconductor distributed Bragg reflector, said thickness and doping concentration being changed in correspondence to electric field strength of light within said semiconductor distributed Bragg reflector.

71. The surface-emission laser diode as

claimed in claim 68, wherein said intermediate layer has an increased thickness and reduced impurity doping concentration in a region of said semiconductor distributed Bragg reflector where the electric field strength of light is large, and wherein said intermediate layer is formed to have a reduced thickness and increased impurity doping concentration in a region of said semiconductor distributed Bragg reflector where the electric field strength of light is small.

72. The surface-emission laser diode as claimed in claim 68, wherein said semiconductor distributed Bragg reflector has a design reflection wavelength of 1.1μm or longer.

73. The surface-emission laser diode as claimed in claim 68, wherein said active layer contains a group III element of any or all of Ga and

In and a group V element of any or all of As, N and Sb.

74. A surface-emission laser array including a plurality of surface-emission laser diodes each having a semiconductor distributed Bragg reflector,

said semiconductor distributed Bragg reflector comprising:

an alternate stacking of first and second semiconductor layers having respective, different refractive indices; and

a plurality of intermediate layers each sandwiched between a first semiconductor layer and a second semiconductor layer, said intermediate layer having a refractive index intermediate between said refractive indices of said first and second semiconductor layers,

an intermediate layer provided in a region of said semiconductor distributed Bragg reflector having a thickness different from an intermediate layer provided in a different region of said

semiconductor distributed Bragg reflector.

75. The surface-emission laser array as claimed in claim 74, wherein a difference of bandgap between said first and second semiconductor layers is set smaller in a region of said semiconductor distributed Bragg reflector where said intermediate layer has an increased thickness than in a region of said distributed Bragg reflector where said intermediate layer has a reduced thickness.

76. The surface-emission laser array as claimed in claim 74, wherein said intermediate layers have different thickness and different doping concentrations within said semiconductor distributed Bragg reflector, said thickness and doping concentration being changed in correspondence to electric field strength of light within said semiconductor distributed Bragg reflector.

77. The semiconductor distributed Bragg reflector as claimed in claim 76, wherein said intermediate layer has an increased thickness and reduced impurity doping concentration in a region of said semiconductor distributed Bragg reflector where the electric field strength of light is large, and wherein said intermediate layer is formed to have a reduced thickness and increased impurity doping concentration in a region of said semiconductor distributed Bragg reflector where the electric field strength of light is small.

78. The surface-emission laser array as claimed in claim 74, wherein said semiconductor distributed Bragg reflector has a design reflection wavelength of 1.1μm or longer.

79. A surface-emission laser module including a surface-emission laser diode having a

semiconductor distributed Bragg reflector,

said semiconductor distributed Bragg reflector comprising:

an alternate stacking of first and second semiconductor layers having respective, different refractive indices; and

a plurality of intermediate layers each sandwiched between a first semiconductor layer and a second semiconductor layer, said intermediate layer having a refractive index intermediate between said refractive indices of said first and second semiconductor layers,

an intermediate layer provided in a region of said semiconductor distributed Bragg reflector having a thickness different from an intermediate layer provided in a different region of said semiconductor distributed Bragg reflector.

80. A surface-emission laser module as claimed in claim 79, wherein said surface-emission laser diode is provided in plural number in the form of an array.

81. An optical interconnection system including a surface-emission laser diode having a semiconductor distributed Bragg reflector,

said semiconductor distributed Bragg reflector comprising:

an alternate stacking of first and second semiconductor layers having respective, different refractive indices; and

a plurality of intermediate layers each sandwiched between a first semiconductor layer and a second semiconductor layer, said intermediate layer having a refractive index intermediate between said refractive indices of said first and second semiconductor layers,

an intermediate layer provided in a region of said semiconductor distributed Bragg reflector having a thickness different from an intermediate layer provided in a different region of said semiconductor distributed Bragg reflector.

82. An optical interconnection system as claimed in claim 77, wherein said surface-emission

laser diode is provided in plural number in the form of a surface-emission laser array.

83. An optical interconnection system as claimed in claim 81, wherein said surface-emission laser diode forms a surface-emission laser module.

84. An optical telecommunication system including a surface-emission laser diode having a semiconductor distributed Bragg reflector,

said semiconductor distributed Bragg reflector comprising:

an alternate stacking of first and second semiconductor layers having respective, different refractive indices; and

a plurality of intermediate layers each sandwiched between a first semiconductor layer and a second semiconductor layer, said intermediate layer having a refractive index intermediate between said

refractive indices of said first and second semiconductor layers,

an intermediate layer provided in a region of said semiconductor distributed Bragg reflector having a thickness different from an intermediate layer provided in a different region of said semiconductor distributed Bragg reflector.

85. An optical interconnection system as claimed in claim 84, wherein said surface-emission laser diode is provided in plural number in the form of a surface-emission laser array.

86. An optical telecommunication system as claimed in claim 84, wherein said surface-emission laser diode forms a surface-emission laser module.

87. An n-type semiconductor distributed Bragg reflector comprising:

first and second semiconductor layers of n-type stacked with each other, said first and second semiconductor layers having respective refractive indices different from each other; and

an intermediate layer provided between said first and second semiconductor layers, said intermediate layer having a refractive index intermediate of said refractive indices of said first and second semiconductor layers.

88. An n-type semiconductor distributed Bragg reflector as claimed in claim 87, wherein said intermediate layer has a thickness larger than 20 [nm] in said n-type semiconductor distributed Bragg reflector.

89. An n-type semiconductor distributed

Bragg reflector as claimed in claim 87, wherein said intermediate layer has a thickness equal to or larger than 30 [nm] in said n-type semiconductor distributed Bragg reflector.

90. An n-type semiconductor distributed Bragg reflector as claimed in claim 87, wherein said intermediate layer has a thickness t [nm] determined with respect to a reflection wavelength λ [um] of said distributed Bragg reflector so as to fall in the ranges of $20<t\leqq(50\lambda-15)$ [nm].

91. A surface-emission laser diode having an n-type semiconductor distributed Bragg reflector,

said n-type semiconductor distributed Bragg reflector comprising:

first and second semiconductor layers of n-type stacked with each other, said first and second semiconductor layers having respective refractive

indices different from each other; and

an intermediate layer provided between said first and second semiconductor layers, said intermediate layer having a refractive index intermediate of said refractive indices of said first and second semiconductor layers.

92. A surface-emission laser diode as claimed in claim 91, wherein said intermediate layer has a thickness larger than 20 [nm] in said n-type semiconductor distributed Bragg reflector.

93. A surface-emission laser diode as claimed in claim 91 wherein said intermediate layer has a thickness equal to or larger than 30 [nm] in said n-type semiconductor distributed Bragg reflector.

94. A surface-emission laser diode as claimed in claim 91, wherein said intermediate layer has a thickness t [nm] determined with respect to a reflection wavelength λ [um] of said distributed Bragg reflector so as to fall in the ranges of $20<t\leqq(50\lambda-15)$ [nm].

95. A surface-emission laser diode as claimed in claim 91, wherein said active layer is formed of a group III element and a group V element, said group III element of said active layer being any or all of Ga and In, said group V element of said active layer being any or all of As, N, Sb and P.

96. A surface-emission laser diode, comprising:

an active layer;

an n-type semiconductor distributed Bragg reflector; and

a p-type semiconductor distributed Bragg reflector,

said n-type semiconductor distributed Bragg reflector and said p-type semiconductor distributed Bragg reflector being disposed at both sides of said active layer,

wherein said n-type semiconductor distributed Bragg reflector is processed to form a mesa.

97. A surface-emission laser diode as claimed in claim 96, wherein said n-type semiconductor distributed Bragg reflector comprises stacking of first and second semiconductor layers having respective, mutually different refractive indices, said n-type semiconductor distributed Bragg reflector further comprises an intermediate layer having a refractive index intermediate of said first and second semiconductor layer, between said first and second semiconductor layers.

98. A surface-emission laser diode as claimed in claim 96, wherein said n-type semiconductor distributed Bragg reflector comprises stacking of first and second semiconductor layers having respective refractive indices different from each other, said n-type semiconductor distributed Bragg reflector further including an intermediate layer having a refractive index intermediate of said refractive indices of said first and second semiconductor layers between said first and second semiconductor layers with a thick larger than 20 [nm].

99. A surface-emission laser diode as claimed in claim 96, wherein said n-type semiconductor distributed Bragg reflector comprises stacking of a first and second semiconductor layers having respective refractive indices different from each other, said n-type semiconductor distributed Bragg reflector further including an intermediate layer having a refractive index intermediate of said first and second semiconductor layers between said first and second semiconductor layers with a

thickness of 30 [nm] or more.

100. A surface-emission laser diode as claimed in claim 96, wherein said n-type semiconductor distributed Bragg reflector comprises stacking of first and second semiconductor layers having respective refractive indices different from each other, said n-type semiconductor distributed Bragg reflector further including an intermediate layer having a refractive index intermediate of said first and second semiconductor layers, between said first and second semiconductor layers with a thickness t [nm] determined with respect to a reflection wavelength λ [um] of said distributed Bragg reflector so as to fall in the ranges of $20<t\leqq(50\lambda-15)$ [nm].

101. A surface-emission laser diode as claimed in claim 96, wherein said active layer is

formed of a group III element and a group V element, said group III element of said active layer being any or all of Ga and In, said group V element of said active layer being any or all of As, N, Sb and P.

102. A surface-emission laser diode comprising:

an active layer;

an n-type semiconductor distributed Bragg reflector; and

a p-type semiconductor distributed Bragg reflector, said n-type semiconductor distributed Bragg reflector and said p-type semiconductor distributed Bragg reflector being disposed at both sides of said active layer,

said n-type semiconductor distributed Bragg reflector having an increased resistance with respect to a region forming a cavity of said the surface-emission laser diode.

103. A surface-emission laser diode as claimed in claim 102, wherein said n-type semiconductor distributed Bragg reflector comprises stacking of first and second semiconductor layers having respective, mutually different refractive indices, said n-type semiconductor distributed Bragg reflector further comprising an intermediate layer having a refractive index intermediate of said first and second semiconductor layer, between said first and second semiconductor layers.

104. A surface-emission laser diode as claimed in claim 102, wherein said n-type semiconductor distributed Bragg reflector comprises stacking of first and second semiconductor layers having respective refractive indices different from each other, said n-type semiconductor distributed Bragg reflector further including an intermediate layer having a refractive index intermediate of said refractive indices of said first and second semiconductor layers between said first and second semiconductor layers with a thick larger than 20 [nm].

105. A surface-emission laser diode as claimed in claim 102, wherein said n-type semiconductor distributed Bragg reflector comprises stacking of a first and second semiconductor layers having respective refractive indices different from each other, said n-type semiconductor distributed Bragg reflector further including an intermediate layer having a refractive index intermediate of said first and second semiconductor layers between said first and second semiconductor layers with a thickness of 30 [nm] or more.

106. A surface-emission laser diode as claimed in claim 102, wherein said n-type semiconductor distributed Bragg reflector comprises stacking of first and second semiconductor layers having respective refractive indices different from each other, said n-type semiconductor distributed Bragg reflector further including an intermediate layer having a refractive index intermediate of said first and second semiconductor layers, between said first and second semiconductor layers with a

thickness t [nm] determined with respect to a reflection wavelength λ [um] of said distributed Bragg reflector so as to fall in the ranges of $20<t\leqq(50\lambda-15)$ [nm].

107. A surface-emission laser diode as claimed in claim 102, wherein said active layer is formed of a group III element and a group V element, said group III element of said active layer being any or all of Ga and In, said group V element of said active layer being any or all of As, N, Sb and P.

108. A surface-emission laser array including a surface-emission laser diode, said surface-emission laser diode having an n-type semiconductor distributed Bragg reflector,

said n-type semiconductor distributed Bragg reflector comprising:

first and second semiconductor layers of n-

type stacked with each other, said first and second semiconductor layers having respective refractive indices different from each other; and

an intermediate layer provided between said first and second semiconductor layers, said intermediate layer having a refractive index intermediate of said refractive indices of said first and second semiconductor layers.

109. A surface-emission laser array as claimed in claim 108, wherein said intermediate layer has a thickness larger than 20 [nm] in said n-type semiconductor distributed Bragg reflector.

110. A surface-emission laser array as claimed in claim 108, wherein said intermediate layer has a thickness equal to or larger than 30 [nm] in said n-type semiconductor distributed Bragg reflector.

111. A surface-emission laser array as claimed in claim 108, wherein said intermediate layer has a thickness t [nm] determined with respect to a reflection wavelength λ [um] of said distributed Bragg reflector so as to fall in the ranges of $20<t\leqq(50\lambda-15)$ [nm].

112. A surface-emission laser array including a surface-emission laser diode, said surface-emission laser diode, comprising:

an active layer;

an n-type semiconductor distributed Bragg reflector; and

a p-type semiconductor distributed Bragg reflector,

said n-type semiconductor distributed Bragg reflector and said p-type semiconductor distributed Bragg reflector being disposed at both sides of said active layer,

wherein said n-type semiconductor distributed Bragg reflector is processed to form a mesa.

113. A surface-emission laser array as claimed in claim 112, wherein said intermediate layer has a thickness larger than 20 [nm] in said n-type semiconductor distributed Bragg reflector.

114. A surface-emission laser array as claimed in claim 112, wherein said intermediate layer has a thickness equal to or larger than 30 [nm] in said n-type semiconductor distributed Bragg reflector.

115. A surface-emission laser array as claimed in claim 112, wherein said intermediate layer has a thickness t [nm] determined with respect to a reflection wavelength λ [um] of said distributed Bragg reflector so as to fall in the ranges of $20<t\leqq(50\lambda-15)$ [nm].

116. A surface-emission laser array including a surface-emission laser diode, said surface-emission laser diode comprising:

an active layer;

an n-type semiconductor distributed Bragg reflector; and

a p-type semiconductor distributed Bragg reflector, said n-type semiconductor distributed Bragg reflector and said p-type semiconductor distributed Bragg reflector being disposed at both sides of said active layer,

said n-type semiconductor distributed Bragg reflector having an increased resistance with respect to a region forming a cavity of said the surface-emission laser diode.

117. A surface-emission laser module including a surface-emission laser diode, said surface-emission laser diode having an n-type semiconductor distributed Bragg reflector,

said n-type semiconductor distributed Bragg reflector comprising:

first and second semiconductor layers of n-type stacked with each other, said first and second semiconductor layers having respective refractive indices different from each other; and

an intermediate layer provided between said first and second semiconductor layers, said intermediate layer having a refractive index intermediate of said refractive indices of said first and second semiconductor layers.

118. A surface-emission laser module including a surface-emission laser diode, said surface-emission laser diode, comprising:

an active layer;

an n-type semiconductor distributed Bragg reflector; and

a p-type semiconductor distributed Bragg reflector,

said n-type semiconductor distributed Bragg reflector and said p-type semiconductor distributed Bragg reflector being disposed at both sides of said active layer,

wherein said n-type semiconductor distributed Bragg reflector is processed to form a mesa.

119. A surface-emission laser module including a surface-emission laser diode, said surface-emission laser diode comprising:

an active layer;

an n-type semiconductor distributed Bragg reflector; and

a p-type semiconductor distributed Bragg reflector, said n-type semiconductor distributed Bragg reflector and said p-type semiconductor distributed Bragg reflector being disposed at both sides of said active layer,

said n-type semiconductor distributed Bragg reflector having an increased resistance with respect to a region forming a cavity of said the surface-emission laser diode.

120. An optical interconnection system including a surface-emission laser diode, said surface-emission laser diode having an n-type semiconductor distributed Bragg reflector, said aid n-type semiconductor distributed Bragg reflector comprising:

first and second semiconductor layers of n-type stacked with each other, said first and second semiconductor layers having respective refractive indices different from each other; and

an intermediate layer provided between said first and second semiconductor layers, said intermediate layer having a refractive index intermediate of said refractive indices of said first and second semiconductor layers.

121. An optical interconnection system including a surface-emission laser diode, said surface-emission laser diode, comprising:

an active layer;

an n-type semiconductor distributed Bragg reflector; and

a p-type semiconductor distributed Bragg reflector,

said n-type semiconductor distributed Bragg reflector and said p-type semiconductor distributed Bragg reflector being disposed at both sides of said active layer,

wherein said n-type semiconductor distributed Bragg reflector is processed to form a mesa.

122. An optical interconnection system including a surface-emission laser diode, said surface-emission laser diode comprising:

an active layer;

an n-type semiconductor distributed Bragg reflector; and

a p-type semiconductor distributed Bragg reflector, said n-type semiconductor distributed Bragg reflector and said p-type semiconductor distributed Bragg reflector being disposed at both sides of said active layer,

said n-type semiconductor distributed Bragg

reflector having an increased resistance with respect to a region forming a cavity of said the surface-emission laser diode.

123. An optical telecommunication system including a surface-emission laser diode, said surface-emission laser diode having an n-type semiconductor distributed Bragg reflector,

said n-type semiconductor distributed Bragg reflector comprising:

first and second semiconductor layers of n-type stacked with each other, said first and second semiconductor layers having respective refractive indices different from each other; and

an intermediate layer provided between said first and second semiconductor layers, said intermediate layer having a refractive index intermediate of said refractive indices of said first and second semiconductor layers.

124. An optical telecommunication system comprising a surface-emission laser diode, said surface-emission laser diode, comprising:

an active layer;

an n-type semiconductor distributed Bragg reflector; and

a p-type semiconductor distributed Bragg reflector,

said n-type semiconductor distributed Bragg reflector and said p-type semiconductor distributed Bragg reflector being disposed at both sides of said active layer,

wherein said n-type semiconductor distributed Bragg reflector is processed to form a mesa.

125. An optical telecommunication system including a surface-emission laser diode, said surface-emission laser diode comprising:

an active layer;

an n-type semiconductor distributed Bragg reflector; and

a p-type semiconductor distributed Bragg reflector, said n-type semiconductor distributed Bragg reflector and said p-type semiconductor distributed Bragg reflector being disposed at both sides of said active layer,

said n-type semiconductor distributed Bragg reflector having an increased resistance with respect to a region forming a cavity of said the surface-emission laser diode.